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Mandibular Reconstruction Post Mandibular Resection Operation in Head and Neck Tumor Patients at Dr Soetomo General Hospital

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Abstract

Surgeons still find challenges with mandibular reconstruction following removal of head and neck malignancies, osteomyelitis, and osteoradionecrotic mandible. Mastication, articulation, swallowing, and breathing issues can all result from the loss of a portion of the mandibular bone as a result of resection. Improved function, contour, and aesthetics are the goals of comprehensive mandibular reconstruction. Over the past few decades, various mandibular reconstructive techniques have been developed, along with their potential for difficulties. This research was an observational descriptive study with retrospective data collected from January 2018 to May 2022 to identify the clinical outcomes of patients undergoing post-resection mandibular reconstruction and the profile of patients with head and neck tumors at Dr. Soetomo General Hospital, Surabaya. We analyze a total of 55 patients. The majority of mandibular reconstruction patients at RSUD Dr. Soetomo Surabaya following resection are in the age range of 40 to 49 years, with the majority of abnormalities resulting from ameloblastoma. The reconstruction plate was the most often used reconstructive technique for mandibular deformity, which measured around 8 cm in length. In this study, the exposed plate was the most frequent problem, and the average period of mandibular reconstructive therapy was about 8 days. Mandibular reconstruction can give different results in each patient. For patients with recurring head and neck cancers, in particular, adequate cosmetic and functional outcomes, as well as radiation tolerance, are necessary.

INTRODUCTION

Surgeons still face difficulties with mandibular reconstruction following removal of head and neck malignancies, osteomyelitis, and osteoradionecrotic mandible. Airway blockage, difficulties biting due to tooth loss or malocclusion, difficulty speaking and swallowing, and cosmetic deformities due to loss of lower facial features are just a few of the issues that can result from mandibular continuity loss (Kakarala et al., 2018). This term includes soft tissue connected nearby structures, such as the tongue, buccal mucosa, and/or skin of the face and neck, as well as the functional and cosmetic ramifications. It does not only apply to mandibular bone discontinuities (fractures). Although occasionally it is not very satisfactory in specific cases, the mandibular reconstruction is always being modified to improve mandibular function.

The most common type of mandibular defect is a segmental defect that occurs as a result of mandibular tumor resection (Kumar et al., 2016). The case of mandibular tumor that often appears is Ameloblastoma (odontogenic). A devastating kind of ameloblastoma that affects

80% of the region of the molars and ramus and can result in mandibular defects (Sarlabous and Psutka, 2018; Bellei et al., 2020).

Depending on the mandibular reconstruction technique used, different complications may arise. Infection and poor wound healing are two common complications associated with skin flaps (necrotic flap) (Septian, Sulistyani and Nasuri, 2022), whereas with plate placement there can be malocclusion, discomfort in the Temporo-Mandibular Joint (TMJ), or injury nerve. According to reports, between 5 and 20 % of patients who have plates placed for mandibular reconstruction need to have surgery again to have the plates adjusted (Kumar et al., 2016).

Data from medical records gathered between 2015 and 2018 at Dr Soetomo Hospital Surabaya included 100 cases of head and neck surgery involving mandibular resection and mandibular reconstruction. Kirschner Wire and plates are used in reconstruction the most commonly (Utama et al., 2020). However, no follow-up information on complications related to the mandibular reconstruction treatment was discovered at Dr. Soetomo Hospital. Over time, the Head and Neck Surgery division of the Department of Surgery, RSUD dr Soetomo Surabaya, employed and developed a variety of modalities, including flaps and bone grafts. Given this context, the authors are motivated to perform a study on the characteristics of head and neck cancer patients undergoing post-resection mandibular reconstruction at Dr Soetomo Hospital Surabaya, as well as to assess the clinical results of the procedure.

This research aims to describe the demographic characteristics, tumor types, defect patterns, and reconstruction procedures performed on head and neck tumor patients undergoing mandibular reconstruction at Dr. Soetomo General Hospital, Surabaya. Additionally, this research evaluates the clinical outcomes, including complication types and frequencies, as well as the length of hospital stay associated with the reconstruction procedures. This research provides theoretical benefits by contributing to the development of head and neck surgery knowledge in Indonesia, enriching academic literature on mandibular reconstruction techniques, and providing baseline data for future comparative studies. Practically, this study assists surgeons in selecting appropriate reconstruction techniques, helps clinicians anticipate complications, supports informed surgical decision-making, and provides healthcare administrators with data for resource planning. From a policy perspective, this research informs the development of clinical guidelines, supports quality improvement initiatives, and contributes to improving surgical outcomes and patient safety in mandibular reconstruction procedures.

METHOD

Study Design and Participants

This was a retrospective descriptive study conducted at Dr. Soetomo General Hospital (Surabaya, Indonesia). We retrospectively reviewed 55 medical records of patients who underwent mandibular reconstruction after mandibular resection with head and neck tumors at dr. Soetomo Surabaya in the period January 2018 – May 2022.

The mandibular reconstruction procedure in this study was performed on patients with mandibular defects due to mandibular tumor resection at dr Soetomo Hospital Surabaya. A mandibular defect is the loss of continuity of the mandible, including the related soft tissue as well as the bone (fracture), which affects the mandible's appearance and functionality. Using

the Jewer classification, mandibular deformities are categorized: C for Central Defect involves the canina, L for lateral defect without involving the condyles, and H for hemimandibular involves the condyles.

This study was reviewed and approved by the Medical Ethical Committee of dr. Soetomo General Hospital Surabaya following the guidelines of the Declaration of Helsinki.

Data Collection

We reviewed medical records for all 55 patients who met the criteria. All the data were obtained from paper-based medical records and electronic medical records. Patient details that are gathered include name, medical record number, age, date of birth, history, physical examination, diagnosis, type of resection, size of defect, type of reconstruction, complications, and duration of stay. In order to be included in this study, patients' medical records who had mandibular excision and reconstruction for head and neck tumors between January 2018 and May 2022 were required, whereas inadequate medical record data were required for exclusion.

Statistical Analysis

Statistical analysis was performed using the SPSS statistical software package version 24.0 (IBM Corp., Armonk, NY, USA). Data were analyzed univariately to identify the distribution of head and neck tumor patients who underwent mandibular resection with mandibular reconstruction based on age, sex, tumor type, size of mandibular defect, types of mandibular reconstruction, as well as post-reconstructive clinical outcomes.

The findings will be displayed in tabular format along with proportion measures for categorical variables. In the meanwhile, numerical data will be represented by the mean, the maximum and minimum values, and the standard deviation.

RESULTS AND DISCUSSION

Patient characteristics

There were 55 patients who underwent mandibular reconstruction after mandibular resection with head and neck tumors at dr. Soetomo Surabaya in the period January 2018 – May 2022 that met the inclusion and exclusion criteria. In terms of gender, it was found almost equally between men and women. Women obtained as many as 26 patients with a percentage of 47.3% while men were 29 patients with a percentage of 52.7%. All patients with a mean age of 42.4 ± 16.3 years. The age range for the youngest and oldest subjects was 9 years for the youngest and 78 years for the oldest. The highest age group was found in the 40–49-year age group as many as 14 patients (25.5%).

Based on the diagnosis, the sample with the highest proportion was ameloblastoma as many as 27 patients (49.1%). Followed by the proportion of non-melanotic skin cancer as many as 8 patients (14.5%), Salivary gland cancer in 6 patients (10.9%), dentigerous cysts in 4 patients (7.3%) and ossifying fibroma in 4 patients (7, 3%). The classification of mandibular defects in this study found that the samples with the highest proportion were hemimandibulectomy (Class II defects) as many as 36 patients (65.5%). Followed by class I defects as many as 10 patients (18.2%), Class III defects as many as 5 patients (9.1%), Class IV defects as many as 4 patients (7.3%).

Based on the mandibular defect, the average defect size was 8.9 ± 1.5 cm. The size range of the largest and smallest defects is 12 cm and 5 cm, respectively. The most defect sizes were found at 8 cm in 17 patients (30.9%) and 10 cm in size in 14 patients (25,5%). The type of mandibular reconstruction procedure obtained samples with the most common type of reconstruction being plate reconstruction as many as 22 patients (40.4%). Followed by Kirschner wire procedure as many as 17 patients (30.9%), Bone graft as many as 9 patients (16.4%), Skin flap as many as 7 patients (12.7%).

Based on the complications obtained samples without complications (good) as many as 23 patients (41.8%). While the most complications of mandibular reconstruction were exposed as many as 23 patients (41.8%), followed by fistula as many as 7 patients (12.7%), and necrotic flap as many as 2 patients (3.6%). In addition, the exposed complications in 23 samples found the highest number of exposed plate types with a total of 15 (65.2%). This was followed by exposed wire with a total of 6 (26.1%) and exposed bone graft with a total of 3 (8.7%).

Based on the length of stay in the hospital, the average was 8 days ± 3.0 days. With the longest treatment duration is 5 days and the longest is 21 days. The sample with the longest length of treatment was in the 8–14-day treatment group, as many as 31 patients (56.4%). Followed by treatment <8 days for 22 patients (40.0%), and treatment for 15-21 days only for 2 patients (3.6%).

Table 1. Patient characteristics are shown

Patient Characteristics	**Total**	**Percentage**
Gender		
Woman	26	47,3
Man	29	52,7
Age		
<20	3	5.5
20-29	12	21.8
30-39	9	16.4
40-49	14	25.5
50-59	10	18.2
60-69	4	7.3
70-79	3	5.5
Diagnosis		
Ameloblastoma	27	49.1
dentigerous cyst	4	7.3
Salivary gland cancer	6	10.9
Non Melanotic Skin cancer	8	14.5
ossifying fibroma	4	7.3
other	6	10.9
Resection Action		
Class I defects	10	18.2

Class II defect	36	65.5
Class III Defect	5	9.1
Class IV Defect	4	7.3
Large Defect		
5	1	1.8
6	1	1.8
7	7	12.7
8	17	30.9
9	7	12.7
10	14	25.5
11	5	9.1
12	3	5.5
Reconstruction Action		
Kirschner Wire	17	30.9
Reconstruction Plate	22	40
Bone graft	9	16.4
Skin Flap	7	12.7
Complications		
No complications	23	41.8
Exposed plate/Bone	23	41.8
Oro cutaneous fistula	7	12.8
Necrotic flap	2	3.6
Exposed Type		
Bone Graft	2	8.7
K-Wire	6	26.1
Plate	15	65.2
Length of Stay		
<8	22	40
8 - 14	31	56.4
15-21	2	3.6

Source: Medical records of Dr. Soetomo General Hospital Surabaya, processed by the author (2026)

Discussion

The research method used in this study is descriptive to determine the profile of mandibular reconstruction patients after mandibular resection in head and neck tumor patients at Dr. Hospital. Soetomo Surabaya during the period 2018-2022.

There were nearly equal numbers of men and women based on gender. Women received up to 26 patients with a 47.3 % percentage, while men received 29 patients with a 52.7 % rate.

Studies have shown that both men and women are affected equally, and that the median age of involvement is around 35 years old (Saghravanian *et al.*, 2016). In contrast to the study by Bosc et al., which included 18 patients, our investigation included 15 men patients and 3 women patients, with a mean age of 60 years (range, 49-71 years) and a tumor histology of squamous cell carcinoma (range, 49-71 years) (Bosc *et al.*, 2017).

Based on age obtained an average of 42.4 ± 16.3 years. The oldest age group, 40 to 49 years old, contained up to 14 patients (25.5 %). It can take years for people to seek medical attention, where treatment is much more difficult due to the size of the tumor because nearly half of the cases in this study were patients with ameloblastoma, which on average develop slowly. The mean age of the Indonesian patients was 39.7 years, which is comparable to the Western (39.9 years) and Asian (41.2 years) patients who had this malignancy. According to Ruslin's research, the average age for men was 41.00 and for women it was 38.64 (Ruslin *et al.*, 2018).

According to the diagnostic, up to 27 patients with ameloblastoma made up the sample with the highest proportion (49.1 %). Ameloblastoma, an aggressive but limited benign tumor of epithelial origin, can develop from the lining of an odontogenic cyst, dental follicles, periodontal ligament, or enamel. Despite being a rare head and neck tumor, ameloblastoma is nevertheless the most prevalent and often seen odontogenic tumor (Johnson *et al.*, 2014).

Based on the resection, the samples with the highest proportion included up to 36 patients who underwent hemimandibulectomy and had class II abnormalities (65.5 %). The best course of action for treating ameloblastoma or other tumors and malignant masses that involve half of the mandible during surgery is a hemimandibulectomy; this shows that the tumor mass has locally invaded the facial muscles and destroyed the mandibular bone (Mauludin and Pramanik, 2017). In this study, there were numerous instances of ameloblastoma and other cancers that spread from the muscle to the mandible bone, necessitating hemimandibulectomy.

Based on the mandibular defect, the average defect size was 8.9 ± 1.5 cm with the most defect size being 8 cm in 17 patients (30.9%) and 10 cm in size in 14 patients (25.5%). In the Bosc research, the overall extent of the bone defect following mandibulectomy ranged from 3 to 15 cm (Bosc *et al.*, 2017). Out of 30 individuals with mandibular continuity abnormalities, another study revealed that the average length of the mandibular flaws was 5.5 cm (with a range of 1.0 to 12.5 cm) (Melville *et al.*, 2020). As a result, it may be inferred that the size of the mandibular defect following resection varies according to the tumor's size and the surgeon's choice to distance the tumor margin.

Based on the mandibular reconstruction process, it was discovered that the sample with the greatest amount of reconstruction was employing a reconstruction plate with up to 22 patients (40.4 %). The simplest solution to restore shape and preserve mandibular stability is titanium plates. Complications and a high failure rate are associated with plates. Both intraorally and externally, scar contractures can result in plate erosion. Due to the connecting segments' hollow holes with limited cross-sectional volumes, even huge reconstruction plates cannot endure masticatory stresses over time. Finally, all plates are more susceptible to damage, especially to the teeth, without bone renewal. In time, screws may also come free, resulting in a fixation that is unstable. The mandibular segment moved in an unstable manner as a result of hardware failure since there was no new bone to fill the gap. Additionally, patients

with major medical comorbidities who cannot endure prolonged anesthesia periods typically have titanium plate reconstruction (Genden and Varvares, 2008).

According to the complications, up to 23 individuals experienced exposed plate/wire/bone graft complications following mandibular surgery (41.8 %). The type of exposed plate, which included up to 15 patients, had the maximum number of exposed in this investigation (65.2 %). This is in line with earlier research' findings that exposed plates are more likely to result from reconstructed plates (Knott *et al.*, 2007). This is due to two factors. First, titanium plate manufacturing technology has advanced steadily since the invention of the first titanium plate. The new reconstruction plate, in particular, has a more compact profile, improved durability, and better biocompatibility. Second, the use of locking technology eliminates the use of screws for fixing. The advantage of the locking system is that it reduces the stress on the plate to the bone, resulting in fewer plate complications (Zhang *et al.*, 2019).

Additionally, dehiscence of wounds with or without plate exposure might result in exposed plates. For the majority of patients, it was also the most typical consequence involving intraoral wounds, and in one case, it led to plate loss (failure). Other studies have seen this problem at various rates, including 8.8 % (Markwardt *et al.*, 2007) and 21.7 % (Yi *et al.*, 1999). According to Yi study, the radiation significantly reduces the likelihood of plate exposure and wound dehiscence (Yi *et al.*, 1999). According to Ueyama, plate exposure may also happen as a result of a tumor recurrence (Ueyama *et al.*, 1996). In addition to mild local infection, tension in the suture wound, and the absence of bone to support the continuity defect, which can cause mucosal wound dehiscence, wound dehiscence and plate exposure are risk factors for pre- or postoperative radiotherapy, which are known to increase complications and failure of reconstruction (Bede, Ismael and Hashim, 2019).

Based on the length of stay in the hospital, it was found that an average of 8 days ± 3 days with the most length of treatment found in the 8–14-day treatment group, namely 31 patients (56.4%). The length of patient care in the hospital of course also has a direct impact on the cost of treatment (Niu *et al.*, 2018; Kao *et al.*, 2019). Patients who experience complications during mandibular repair will need to stay in the hospital for longer.

CONCLUSION

Mandibular reconstruction can give different results in each patient. Especially for patients with malignancy and recurrence situations, it is imperative to design a mandibular reconstruction that can deliver quick and dependable outcomes with appropriate cosmetic and functional results and tolerance to radiotherapy. Additional investigation is required to assess the effectiveness of various mandibular reconstruction procedures that can be performed and developed at Dr. Soetomo Hospital Surabaya as well as the risk factors that can make difficulties in reconstruction. Based on these findings, several recommendations are proposed. Surgeons should carefully consider patient selection for plate-only reconstruction, particularly in larger defects or radiotherapy cases, and consider alternative techniques such as vascularized flaps when appropriate. Hospitals should establish standardized postoperative monitoring protocols and multidisciplinary collaboration to optimize outcomes. Patients require comprehensive preoperative counseling regarding potential complications and realistic expectations. Future research should employ prospective designs with larger samples, longer

follow-up, and comparative analysis of reconstruction techniques to identify the most effective approaches and risk factors for failure.

REFERENCES

Bede, S. Y. H., Ismael, W. K. and Hashim, E. A. (2019) 'Reconstruction plate-related complications in mandibular continuity defects.', Oral and maxillofacial surgery, 23(2), pp. 193–199. doi: 10.1007/s10006-019-00762-5.

Bellei, B. et al. (2020) 'The Role of Dermal Fibroblasts in Nevoid Basal Cell Carcinoma Syndrome Patients: An Overview', International Journal of Molecular Sciences, 21(3), p. 720. doi: 10.3390/ijms21030720.

Bosc, R. et al. (2017) 'Mandibular reconstruction after cancer: an in-house approach to manufacturing cutting guides.', International journal of oral and maxillofacial surgery, 46(1), pp. 24–31. doi: 10.1016/j.ijom.2016.10.004.

Genden, E. M. and Varvares, M. A. (2008) Head and Neck Cancer: An Evidence-based Team Approach. Thieme (Thieme Publishers Series). Available at: https://books.google.co.id/books?id=ned0Oxcr2CwC.

Johnson, N. R. et al. (2014) 'Frequency of odontogenic cysts and tumors: a systematic review.', Journal of investigative and clinical dentistry, 5(1), pp. 9–14. doi: 10.1111/jicd.12044.

Kakarala, K. et al. (2018) 'Mandibular reconstruction', Oral Oncology, 77(December 2017), pp. 111–117. doi: 10.1016/j.oraloncology.2017.12.020.

Kao, A. M. et al. (2019) 'Outcomes of open abdomen versus primary closure following emergent laparotomy for suspected secondary peritonitis: A propensity-matched analysis', Journal of Trauma and Acute Care Surgery, 87(3), pp. 623–629. doi: 10.1097/TA.0000000000002345.

Knott, P. D. et al. (2007) 'Evaluation of hardware-related complications in vascularized bone grafts with locking mandibular reconstruction plate fixation.', Archives of otolaryngology--head & neck surgery, 133(12), pp. 1302–1306. doi: 10.1001/archotol.133.12.1302.

Kumar, B. P. et al. (2016) 'Mandibular Reconstruction: Overview', Journal of Maxillofacial and Oral Surgery, 15(4), pp. 425–441. doi: 10.1007/s12663-015-0766-5.

Markwardt, J. et al. (2007) 'Analysis of complications after reconstruction of bone defects involving complete mandibular resection using finite element modelling.', Onkologie, 30(3), pp. 121–126. doi: 10.1159/000098848.

Mauludin, A. and Pramanik, F. (2017) 'The radiographic imaging and management of basal cell type ameloblastoma with hemimandibulectomy: a case report', International Journal of Oral and Maxillofacial Surgery, 46, p. 291. doi: 10.1016/j.ijom.2017.02.980.

Melville, J. C. et al. (2020) 'Is Reconstruction of Large Mandibular Defects Using Bioengineering Materials Effective?', Journal of Oral and Maxillofacial Surgery, 78(4), pp. 661.e1-661.e29. doi: https://doi.org/10.1016/j.joms.2019.11.024.

Niu, B. et al. (2018) ‘Mortality from Spontaneous Bacterial Peritonitis Among Hospitalized Patients in the USA’, Digestive Diseases and Sciences, 63(5), pp. 1327–1333. doi: 10.1007/s10620-018-4990-y.

Ruslin, M. et al. (2018) ‘The Epidemiology, treatment, and complication of ameloblastoma in East-Indonesia: 6 years retrospective study’, Medicina oral, patologia oral y cirugia bucal, 23(1), pp. e54–e58. doi: 10.4317/medoral.22185.

Saghravanian, N. et al. (2016) ‘A 40-year Retrospective Clinicopathological Study of Ameloblastoma in Iran.’, Asian Pacific journal of cancer prevention : APJCP, 17 2, pp. 619–623.

Sarlabous, M. and Psutka, D. J. (2018) ‘Treatment of Mandibular Ameloblastoma Involving the Mandibular Condyle’, Journal of Craniofacial Surgery, 29(3), pp. e307–e314. doi: 10.1097/SCS.0000000000004362.

Septian, A., Sulistyani, L. D. and Nasuri, E. (2022) ‘Rekonstruksi defek plat mandibula dengan fasciocutaneous advancement flap Mandibular plate defect reconstruction with fasciocutaneous advancement flap ’, Jurnal Kedokteran Gigi Universitas Padjadjaran, 33(3), p. 73. doi: 10.24198/jkg.v33i3.34459.

Ueyama, Y. et al. (1996) ‘Analysis of reconstruction of mandibular defects using single stainless steel A-O reconstruction plates.’, Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons, 54(7), pp. 853–858. doi: 10.1016/s0278-2391(96)90536-4.

Utama, AP., Wibowo, MD., Murtedjo,Urip. (2020). Perbandingan Status Mastikasi pada Pasien Ameloblastoma Pasca Operasi Reseksi Segmental Mandibula Tipe LC dengan Rekonstruksi Mandibula Menggunakan Plate dan Kirschner Wire di RSUD Dr. Soetomo Tahun 2015-2018. Universitas Airlangga

Yi, Z. et al. (1999) ‘Reconstruction plates to bridge mandibular defects: a clinical and experimental investigation in biomechanical aspects’, International journal of oral and maxillofacial surgery, 28(6), p. 445—450. doi: 10.1016/s0901-5027(99)80058-7.

Zhang, Z.-L. et al. (2019) ‘Miniplates Versus Reconstruction Plates in Vascularized Osteocutaneous Flap Reconstruction of the Mandible’, Journal of Craniofacial Surgery, 30(2).